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MEMORANDUM

Summary of Alternatives Screening and Review for the Wilcox Oil Company Superfund Site Early Action

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OK0001010917

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Purpose

The purpose of this memorandum is to document the alternatives screening process used to identify cleanup alternatives evaluated in the early action record of decision for the Wilcox Oil Company Superfund Site. Consistent with the National Contingency Plan (NCP) [40 CRF § 300.430(a)(1)], alternatives are limited in scope to addressing tank waste and the lead additive area while the alternative screening and evaluation process is based on data from the ongoing remedial investigation (RI).

Presumptive remedies were developed by the U.S. Environmental Protection Agency (EPA) to streamline the selection of cleanup methods for certain categories of sites by narrowing the consideration of cleanup methods to treatment technologies or remediation approaches that have a proven track record in the Superfund program (EPA, 1997). The EPA has determined that it is appropriate to apply the *Presumptive Remedy for Metals-in-Soil Sites* (EPA, 1999) and the *Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites* (EPA, 1995b) based on the contaminant characteristics found at the site.

Relevant RI data can be summarized briefly and the alternatives are few and straightforward since presumptive remedy guidance is used. Although documentation could be presented in the early action decision document, the EPA is summarizing the screening process in this technical memorandum for clarity and using the early action decision documents for the evaluation of alternatives against the nine criteria.

<u>Interim and Early Action Support</u>

The NCP [40 CFR § 300.430(a)(1)] states, "Remedial actions are to be implemented as soon as site data and information make it possible to do so." This is further clarified in the preamble to the NCP (Federal Register, 1990),

EPA expects to take early action at sites where appropriate and to remediate sites in phases using operable units as early actions to eliminate, reduce or control the hazards posed by a site or to expedite the completion of total site cleanup. In deciding whether to initiate early actions. EPA must balance the desire to definitively characterize site risks and analyze alternative remedial approaches for addressing those threats in great detail with the desire to implement protective measures quickly.

EPA promotes the responsiveness and efficiency of the Superfund program by encouraging action prior to or concurrent with conduct of an RI/FS as information is sufficient to support a remedy selection. These actions may be taken under removal or remedial authorities as appropriate.

The NCP acknowledges that the final remedial investigation (RI), feasibility study (FS), and risk assessment may not be complete and encourages action prior to and concurrent with these processes. In such cases, data from the ongoing RI is used to support the early action and evaluate an appropriate set of alternatives for the limited early action.

<u>Background</u>

On May 24, 2013, EPA proposed the site to the National Priorities List (NPL). On December 12, 2013, the site officially became a Federal Superfund Site (EPA Identification No. OK0001010917), when it was added to the NPL.

The EPA and the Oklahoma Department of Environmental Quality (ODEQ) have conducted multiple investigations at the site since 1994, including site assessments and expanded site investigations. Currently, the remedial investigation is ongoing to define nature and extent of contamination, evaluate the potential human health and ecological risks, and identify potential remediation technologies. No final RI, risk assessments or FS have been completed.

<u>Source Characteristics</u>
Source material is defined as material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water, air, or acts as a source for direct exposure (EPA, 1991).

The Hazard Ranking System (HRS; EPA, 2013) document identified ten (10) potential source areas with associated releases of polynuclear aromatic hydrocarbons (PAHs) and metals to the nearby wetlands and Sand Creek. The RI investigation verified the presence of tank waste at eight (8) former tank areas and one separation pit. Due to its proximity to a residential home, the EPA performed a removal action in October 2017, at one of the former tank locations to address approximately 1,349 tons of tank waste. The remaining former tank areas (7) and separation pit are source materials being proposed for early action due to the presence of high contaminant concentrations, proximity to residential homes, and the proximity to the creek.

Site investigation activities identified two source materials: tank waste and the lead additive area. Table 1 provides a summary of detected contaminants, and Table 2 provides a summary of estimated volumes.

- Tank Waste: The tank waste is an oily tar-like viscous liquid. Results for samples collected from the tank waste are as high as 3,660 milligrams per kilogram (mg/kg) lead, 20 mg/kg Benzo(a)pyrene, 1,400 mg/kg 2-methylnaphthalene, and 875,000 mg/kg total petroleum hydrocarbons (Table 1). The tank waste is not a listed hazardous waste, and data results indicate that the tank waste is not a characteristic hazardous waste.
- Lead additive area: This area is denuded of vegetation and covered by silty sparkling sand and a white, salt-like substance. Lead results for samples collected from this area are as high as 43,200 to 55,049 mg/kg. The lead additive area is not a listed hazardous waste, and data results indicate that the lead additive area is not a characteristic hazardous waste.

<u>Remedial Action Objectives</u>
The remedial action objectives for the tank waste and lead additive area are to

- Prevent exposure to human and ecological receptors through ingestion and dermal contact.
- Prevent further migration of contaminants to soils, sediment, and air mitigating environmental degradation.

<u>Presumptive Remedy Review</u>
Based on the nature and contaminant mixture of the source materials identified at the site, it is appropriate to use the presumptive remedies developed by EPA. During the review

process, additional resources were also reviewed (Platinum, 2002; EPA, 1995a; EPA, 1988).

Tank Waste: The *Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites* (EPA, 1995b) is directed at sites that are contaminated with wood treater preservatives, of which creosote is one. Creosote is an oily, translucent brown to black liquid that is a complex mixture of organic compounds containing approximately 85% PAHs, 10% phenolic compounds, and 5% nitrogen-, sulfur- or oxygen-containing heterocycles. The tank waste is of similar consistency being a viscous oil-tar liquid, and is of similar composition containing primarily PAHs (Table 1) and to a lesser extent simple non-halogenated aromatics, including ethylbenzene, toluene, and xylene.

Lead Additive Area: The *Presumptive Remedy for Metals-in-Soil Sites* (EPA, 1999) is directed at sites or areas that primarily contain metals in soil or related media having similar characteristics. It applies to soil characterized as loose material on the surface and in the subsurface of the earth consisting of mineral grains and organic materials in varying proportions. The lead additive area is contaminated with lead and is a loose material found at the surface or just below.

In addition to the presumptive remedy approach, the technology screening matrix (Figure 1; Platinum, 2002) developed by the Federal Remediation Technology Roundtable was reviewed for potential treatment technologies applicable to tank waste and metal-contaminated soil.

<u>Screening of Technologies and Selection of Representative Technologies</u>

Based on a review of the presumptive remedies, technology screening matrix, site conditions, early action contaminants of potential concern (COPC), and the early action remedial action objectives, a list of remedial technologies and process options commonly discussed among the various resources were identified (Tables 3 and 4). Each process option was further screened based on effectiveness and implementability in relation to site conditions and COPC data. Cost is designated high, moderate, and low, which compares relative costs within the same remedial technology. Through this process, remedial options were further reduced to a limited number of technologies to be considered as early action alternatives.

Tables 3 and 4 summarize the remedial technologies and process options considered, compares the remedial technologies and process options against the three screening criteria, and identifies those remedial technologies and process options screened from further consideration as early actions and those selected for consideration as early actions. Grey highlighted technologies are screened from further consideration.

Technologies Screened from further Consideration

All treatment technologies have been screened out from further consideration as an early action. The tank waste and the lead additive area are not listed hazardous wastes and are not identified as characteristic hazardous wastes. As such, land disposal restrictions are not applicable and treatment is not necessary prior to disposal. In addition, because one source material is organic and one source material is inorganic, a combination of treatment technologies would be needed. In addition, management of the residual could potentially include a third technology (e.g., containment or offsite disposal). Management of the source materials under one technology is more efficient, easier to implement, and more cost effective.

Although data indicate that the lead additive area may contain lead concentrations that are amenable to reclamation, the volume of waste is small and the organic and moisture content may prohibit efficient lead reclamation. Based on site data, the entire estimated volume is not expected to contain lead at concentrations supporting reclamation; therefore, only a limited volume would potentially quality for reclamation. Due to economies of scale, reclamation/recovery technologies generally work best for a continuous feed of large volumes of metals (EPA, 1999).

The bioremediation, thermal and immobilization treatment technologies are not practical for the separate, small areas of contaminated tank waste. Use of these treatment options will require detailed treatability studies to determine the suitable conditions for treatment. There is uncertainty in treatment efficiency, treatment construction, and operation timeframe. In addition, the amount of residual remaining after treatment (EPA 1995b; EPA 1988) is unknown and could result in management and handling of multiple treatment trains. Implementation of these remedies requires a large portion of the site for equipment, material staging, material mixing and handling, and material treatment. This would limit and restrict remaining investigation work. The cost, time, and effort necessary to implement these options outweighs the protection benefit gained when compared to other alternatives.

The containment option involving the use of a vegetation cap has been eliminated from further consideration as an option for the early action. Since the tank waste and lead additive area material will not be treated, the liner provides an additional layer of protection against water infiltration, contaminant migration, and vapor intrusion.

Technologies Screened for further Consideration
Excavation and Containment technologies have been retained for consideration as early actions. The excavation technology removes the sources from the site and eliminates the migration and exposure potential at a reasonable cost. The containment technology consolidates sources into one central location for containment which eliminates the potential for migration and exposure at a reasonable cost. In addition, review of the technology screening matrix shows that these two technologies are above average for relative overall costs and performance when compared with other technologies.

References

National Contingency Plan Preamble. 1990. Federal Register, Volume 55 No. 46, page 8704, March 8.

Platinum International, Inc. 2002. Remediation Technologies Screening Matrix and Reference Guide, 4th Edition. Prepared for the U.S. Army Environmental Center. https://frtr.gov/matrix2/top_page.html. January.

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USEPA. 1988. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. *Technology Screening Guide for Treatment of CERCLA Soils and Sludges*. EPA/540/2-88/004. Washington, D.C. September.

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USEPA. 1995a. U.S. Environmental Protection Agency, Office of Research and Development. *Contaminants and Remedial Options at Selected Metal-Contaminated Sites*. EPA/540/R-95/512. Washington, D.C. July.

USEPA. 1995b. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. *Presumptive remedies for Soils, Sediments, and Sludges at Wood Treater Sites*. EPA/540/R-95/128. Washington, D.C. December.

USEPA. 1997. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response. *Implementing Presumptive Remedies*. EPA 540-R-97-029. Washington, D.C. October.

USEPA. 1999. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. *Presumptive remedies for Metals-in-Soil Sites*. EPA 540-F-98-054. Washington, D.C. September.

USEPA. 2013. U.S. Environmental Protection Agency. *Hazard Ranking System Documentation Record. Wilcox Oil Company, Bristow, Creek County, Oklahoma*. May.

Figure 1

Table 1: Comparison of site data to Health Based Screening Levels				
Source Material	**Contaminant of Potential Concern**	**Data Results (mg/kg)**	**Health Based Screening Level (mg/kg)**	**Health Based Screening Level Basis**
Lead Additive Area	Lead	55,049	200 - 400	Protection of blood lead levels in children
Waste Material	Benzo(a)anthracene	12	1.1	Residential Cancer Screening Number at 10-6 Risk
	Benzo(a)pyrene	12	0.11	Residential Cancer Screening Number at 10-6 Risk
	Benzo(b)fluoranthene	20	1.1	Residential Cancer Screening Number at 10-6 Risk
	Indeno(1,2,3-cd)pyrene	4.4	1.1	Residential Cancer Screening Number at 10-6 Risk
	2-methylnaphthalene	1400	240	Residential Non-cancer Screening Number at Hazard Index=1
	Naphthalene	14	3.8	Residential Cancer Screening Number at 10-6 Risk

Table 2: Volume Estimates of Source Areas	
Area Name	**Volume Estimated (cubic yards)**
Lorraine Waste	952
Lead Additive Area	6,532
Tank 1	3,322
Tank 3	3,608
NTF-1	817
Tank 10	9,902
Tank 11	431
Tank 12	4,788
Pit 1	4,269
Total	34,621 (5.5 Acres)

Table 3: Technology Screening for the Lead Additive Area						
	General Response	**Remedial Technology**	**Process Option**	**Cost#**	**Effectiveness**	**Implementability**
Lead Additive Area	Removal	Physical Removal	Excavation	--	Pros: permanent removal; unrestricted use; no long-term maintenance or administrative controls; eliminates migration Cons: waste not treated;	Pros: commercially available; demonstrated technology; no land disposal restrictions; landfills within 50 miles; short construction period (≥2-3 weeks) Cons: hauling through community; potential worker and community exposure to dust
	Containment	Capping	Clay and Membrane	moderate	Pros: mitigates migration; one consolidated area; water infiltration layer for mitigation of leaching Cons: long-term maintenance needed; 5-yr reviews; administrative controls; land use restrictions; waste not treated	Pros: commercially available; demonstrated technology; no land disposal restrictions; short construction/consolidation period (≥1-1.5 months) Cons: location will compromise current land use and remaining RI; potential worker and community exposure to dust
			Clay and Vegetation	low	Pros: mitigates migration; one consolidated area; Cons: long-term maintenance needed; 5-yr reviews; administrative controls; land use restrictions; soil/vegetative cover may not restrict water to mitigate leaching; no treatment;	Pros: commercially available; demonstrated technology; no land disposal restrictions; short construction period (≥1-1.5 months) Cons: location will compromise current land use and remaining RI investigation; potential worker and community exposure to dust

Notes: Grey cells: screened from further evaluation TCLP: toxicity characteristic leaching procedure #Cost: see Appendix A

Resources: --: no comparison/sole process reviewed

1. Presumptive remedy for Metals-in-Soil Sites, Office of Solid Waste and Emergency Response, EPA-540-F-98-054, OSWER-93550.0-72FS, September 1999.
2. Implementing Presumptive Remedies: A Notebook of Guidance and Resource Materials, Office of Solid Waste and Emergency Response, EPA-540-R-97-029, OSWER 9378.0-11, October 1997.
3. Contaminants and Remedial Options at Selected Metal-Contaminated Sites, Office of Research and Development, EPA/540/R-95/512, July 1995a.

Table 3: Technology Screening for the Lead Additive Area (continued)						
	General Response	**Remedial Technology**	**Process Option**	**Cost#**	**Effectiveness**	**Implementability**
Lead Additive Area	Treatment	Physical and/or Chemical Treatment	Immobilization	low	Pros: effective for metals; minimizes migration Cons: residual management either onsite or offsite disposal; presence of organics/phenols could reduce effectiveness; treatment not necessary as waste is not a listed or characteristic hazardous waste;	Pros: commercially available; demonstrated technology; no land disposal restrictions Cons: increased volume due to additives; may need specialized vendors, additives, and equipment; treatability study needed; extended construction/treatment period (≥5-6 months); potential worker exposure and materials (i.e., source material and additives) handling
			Reclamation	high	Pros: lead concentrations are high Cons: small volume/quantity; high moisture content, presence of sulfur compounds and phenols could reduce removal efficiency; not economically viable (i.e., technology costs exceed benefit); treatment not necessary as waste is not a listed or characteristic hazardous waste	Pros: reclaimed resource Cons: specialized vendors and equipment; construction/treatment period unknown

Notes: Grey cells: screened from further evaluation TCLP: toxicity characteristic leaching procedure #Cost: see Appendix A

Resources: --: no comparison/sole process reviewed

1. Presumptive remedy for Metals-in-Soil Sites, Office of Solid Waste and Emergency Response, EPA-540-F-98-054, OSWER-93550.0-72FS, September 1999.
2. Implementing Presumptive Remedies: A Notebook of Guidance and Resource Materials, Office of Solid Waste and Emergency Response, EPA-540-R-97-029, OSWER 9378.0-11, October 1997.
3. Contaminants and Remedial Options at Selected Metal-Contaminated Sites, Office of Research and Development, EPA/540/R-95/512, July 1995a.

Table 4: Technology Screening for the Tank Waste

	General Response	Remedial Technology	Process Option	Cost[#]	Effectiveness	Implementability
Tank Waste	Removal	Physical Removal	Excavation	--	Pros: permanent removal; unrestricted use; no long-term maintenance; no administrative controls; mitigates migration Cons: waste not treated	Pros: commercially available; demonstrated technology; no land disposal restrictions; landfills within 50 miles; short construction period (≥1-2 months) Cons: hauling through community; potential worker and community exposure to dust
	Containment	Capping	Clay and Membrane	moderate	Pros: water infiltration layer for mitigation of leaching and vapor intrusion; mitigates migration; one consolidated area Cons: long-term maintenance needed; 5-yr reviews; administrative controls; land use restrictions; waste not treated	Pros: commercially available and demonstrated technology; no land disposal restrictions; short construction/ consolidation period (≥3-4 months) Cons: location will compromise current land use and remaining RI; potential worker and community exposure to dust
			Clay and Vegetation	Low	Pros: mitigates migration; one consolidated area Cons: long-term maintenance needed; 5-yr reviews; administrative controls; land use restrictions; soil/vegetative cover may not restrict water to mitigate leaching or restrict vapor intrusion; waste not treated;	Pros: commercially available; demonstrated technology; no land disposal restrictions; short construction/ consolidation period (≥3-4 months) Cons: location will compromise current land use and remaining RI investigation; potential worker and community exposure to dust

Notes: TPH = total petroleum hydrocarbon RI = remedial investigation #Cost: See Appendix A Grey cells: screened from further evaluation

Resources: --: no comparison/sole process reviewed

1. Technology Screening Guide for Treatment of CERCLA Soils and Sludges, Office of Solid waste and Emergency Response, EPA/540/2-88/004, September 1988.
2. Implementing Presumptive Remedies: A Notebook of Guidance and Resource Materials, Office of Solid Waste and Emergency Response, EPA-540-R-97-029, OSWER 9378.0-11, October 1997.
3. Presumptive Remedies for Soils, sediments, and Sludges at Wood Treater Sites, Office of Solid Waste and Emergency Response, EPA 540-R-95-128, OSWER 9200.5-162, December 1995b.

Table 4: Technology Screening for the Tank Waste (continued)						
	General Response	**Remedial Technology**	**Process Option**	**Cost#**	**Effectiveness**	**Implementability**
Tank Waste	Treatment	Physical or Chemical	Immobilization	moderate	Pros: proven effective on organics; mitigates migration Cons: necessary to combine with other technologies to reach full reduction; efficiency limited by high TPH content; residual management onsite or offsite disposal; administrative controls and land use restrictions; treatment not necessary as waste is not a listed or characteristic hazardous waste;	Pros: commercially available; demonstrated technology; no land disposal restrictions; Cons: location will compromise current land use and remaining RI investigation; treatability studies required; may need specialized equipment; extended construction/ treatment period (≥5-6 months); potential worker exposure and materials (i.e., source material and additives) handling
		Thermal	Incineration	High	Pros: effective in treating organics; eliminates migration Cons: cost far exceeds risk reduction benefit when compared with other technologies; treatment not necessary as waste is not a listed or characteristic hazardous waste; residual management onsite or offsite disposal; administrative controls; land use restrictions; potential off-gas production;	Pros: commercially available; demonstrated technology Cons: location will compromise current land use and remaining RI investigation; treatability studies required; significant materials handling; specialized equipment and operators; extended construction/ treatment period (≥5-6 months); viscous nature may require pre-treatment; potential community opposition
			Low Thermal Desorption	High	Pros: effective in treating organics; eliminates migration Cons: combine with other technology for residuals; cost far exceeds risk reduction benefit when compared with other technologies; treatment not necessary as waste is not a listed or characteristic hazardous waste; potential off-gas production;	Pros: commercially available; demonstrated technology Cons: location will compromise current land use and remaining RI investigation; treatability studies required; significant materials handling; specialized equipment and vendor; extended construction/ treatment period (≥ 5-6 months); viscous nature may require pre-treatment; potential community opposition

Table 4: Technology Screening for the Tank Waste (continued)						
	General Response	**Remedial Technology**	**Process Option**	**Cost#**	**Effectiveness**	**Implementability**
Tank Waste		Biological	Land Farming	low	Pros: partially effective on high levels of organics; eliminates migration Cons: residual management onsite or offsite disposal; administrative controls; land use restrictions; treatment not necessary as waste is not a listed or characteristic hazardous waste; limited effectiveness on non-aqueous phase; potential off-gas production;	Pros: generally accepted by community; no specialized equipment Cons: location will compromise current land use and remaining RI investigation; extended construction/ treatment period (≥ 10-12 months); significant materials handling; treatability studies required; viscous nature may require pre-treatment

Notes: TPH = total petroleum hydrocarbon RI = remedial investigation #Cost: See Appendix A Grey cells: screened from further evaluation

Resources:

1. Technology Screening Guide for Treatment of CERCLA Soils and Sludges, Office of Solid waste and Emergency Response, EPA/540/2-88/004, September 1988.
2. Implementing Presumptive Remedies: A Notebook of Guidance and Resource Materials, Office of Solid Waste and Emergency Response, EPA-540-R-97-029, OSWER 9378.0-11, October 1997.
3. Presumptive Remedies for Soils, sediments, and Sludges at Wood Treater Sites, Office of Solid Waste and Emergency Response, EPA 540-R-95-128, OSWER 9200.5-162, December 1995b.

Appendix A: Cost Summaries for Screened Technologies

The Remedial Action Cost Engineering and Requirements (RACER®) System, Version 11.2.16.0 was used to estimate costs and assist with the comparison of alternatives relative to cost. RACER® is a program originally developed by the U.S. Air Force. The program is a parametric cost estimating tool specifically developed for environmental remediation and restoration projects. These estimates are based on current site data and characteristics related to the tank waste and the lead additive area. These estimates were not developed to be all inclusive, and are developed to support a screening level comparison between technologies. A summary of the cost estimates are provided in Table A-1 while printouts of supporting documentation provided through RACER® follow.

Table A-1: Summary of Estimated Cost for Treatment Technologies Screened

Technology	Estimated Cost	Source Addressed	Residual and/or Source Remaining
Excavation	5,260,232	Tank Waste Lead Additive Area	None
Capping-Vegetation	5,286,706	Tank Waste Lead Additive Area	Consolidated Waste
Capping-Geomembrane	5,528,808	Tank Waste Lead Additive Area	Consolidated Waste
Immobilization-Ex-situ*	9,313,528	Tank Waste Lead Additive Area	Treated Residual – capping or offsite disposal
Immobilization-In-situ*	7,471,619	Tank Waste Lead Additive Area	Treated Residual – capping
Onsite Incineration*	175,813,907	Tank Waste	Lead Additive Area Treated Residual
Onsite Low Thermal Desorption*	1,065,505,940	Tank Waste	Lead Additive Area Treated Residual
Land Farming-Ex-situ*	4,756,701	Tank Waste	Lead Additive Area Treated Residual
Reclamation	TBD	Lead Additive Area	Tank Waste

All technologies with an asterisk (*) will need to be combined with one or two other technologies to address the organic and/or inorganic source the technology does not address and the residual remaining. For all such instances, the estimates provided are specific to the source material addressed, and are not inclusive of additional technology options. In addition, estimates of any future year costs at a 7% discounted rate are not included since a variety of technologies can be combined to address all site wastes.

In-Situ Land Farming is not practical or effective at the site because source material is greater than 2 feet deep.

Without a viable market and with the small volume of lead-bearing material at the site, reclamation does not warrant further consideration and cost estimation is not necessary.